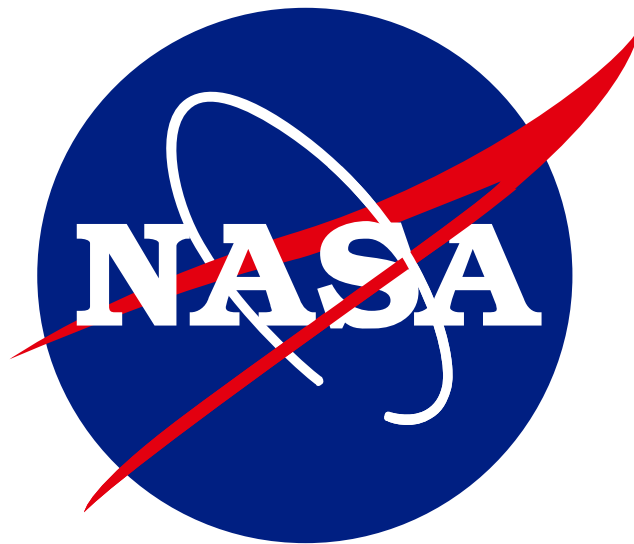


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# **FY 2005 AGENCY-WIDE FACILITIES SUSTAINMENT MODEL**



**Contract Number NASW-00008  
Deliver Order Number 705**

**September 2003**

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## EXECUTIVE SUMMARY

### Background

NASA senior managers have traditionally asked what would be the annual cost to perform maintenance on facilities, as determined from actual requirements or from zero-based methods. However, because of the cost of manpower and time required, NASA has been unable to perform this detailed cost buildup. Instead, the National Research Council recommendation to spend between 2-4% of the current replacement value (CRV) on facility maintenance each year has been the benchmark for federal facilities maintenance. NASA has sought an economical, zero-based approach for assessing required levels of facility maintenance funding in lieu of the "percentage of CRV" methodology.

### The Department of Defense (DoD) Facilities Sustainment Model (FSM)

Over the last four years the DoD has been refining its FSM that provides a parametric estimating tool for forecasting annual maintenance funding requirements for their facilities. Within the FSM, to promote macro-level analysis and planning, DoD implemented a facility classification system that groups facilities with similar functions and units of measure into Facility Analysis Categories (FACs). For each of over four hundred FACs, the DoD Facilities Pricing Guide identifies both sustainment and construction cost factors, as well as the source upon which they are based. Whenever possible, cost factors are based upon commercial benchmarks. As with the FACs they represent, these cost factors are intended for macro-level analysis and planning and are not suitable for individual facilities or projects. DoD updates its FSM annually as it learns lessons from its application.

The DoD FSM defines facilities sustainment as follows:

"[Sustainment] provides resources for maintenance and repair activities necessary to keep a typical inventory of facilities in good working order over a 50-year service life. It includes regularly scheduled adjustments and inspections, preventive maintenance tasks, and emergency response and service calls for minor repairs. It also includes major repairs or replacement of facility components (usually accomplished by contract) that are expected to occur periodically throughout the facility life cycle. This work includes regular roof replacement, refinishing of wall surfaces, repairing and replacement of heating and cooling systems, replacing tile and carpeting, and similar types of work. Not included is the repair or replacement of non-attached equipment or furniture, or building components that typically last more than 50 years (such as foundations and structural members). Sustainment does not include restoration, modernization, environmental compliance, historical preservation or costs related to *force majeure*, which are funded elsewhere. Other tasks associated with facilities operations (such as custodial services, grass cutting, landscaping, waste disposal, and the provision of central utilities) are also not included."

This FSM system has now matured and can be economically applied to NASA's facilities population to generate a parametric estimate of annual maintenance funding needs. The facilities' annual sustainment cost (ASC) estimate obtained is sufficient for its intended use and can be generated quickly at a very low cost.

## **Assumptions**

Arriving at a suggested maintenance funding level for some of NASA's facilities required engineering judgment because of the current level of completeness and accuracy of NASA's real property data or because of the uniqueness of some NASA facilities. That is, some NASA facilities do not have a direct correlation to any DoD FSM category (*e.g.*, launch pads, mobile launchers, etc.). Similarly, some facilities' data from the NASA Real Property Inventory was not correct (*e.g.*, units of measure did not make sense). Within this report, those anomalies are identified with blue shading. Footnotes and acronyms are included at the end of the sustainment model section. Footnotes explain assumptions used in arriving at sustainment recommendations for specific facilities.

## **Results**

This document contains the results of the analysis. In addition to this Executive Summary it includes the Agency-wide Facilities Sustainment Model (FSM). A summary totaled by site location, Center, NASA Program Code and total NASA is shown in Table 1 below. The cells in the FSM contain data from NASA Centers, RPI, DoD handbook or numbers calculated using formulas and the entered data to provide the desired information. The document represents a "work in progress" that will be modified/updated to reflect changes in the NASA data and the DoD Facilities Pricing Guide.

## **Recommendation**

This report is based on an analysis of NASA facilities utilizing the DoD FSM to ascertain a level of funding that NASA requires to be a prudent steward of public assets and to prevent additional deterioration and deferred maintenance. The level required for FY05 is \$344 million compared with \$334 million for FY04.

Table 1. Sustainment Cost by Site, Center, Enterprise and Agency

NAME	FY 2003 CRV (\$M)	NASA FY05 Fac. ASC with no Exclusions	NASA FY05 Fac. ASC with no Exclusions % of CRV	NASA FY05 Fac. ASC with Exclusions PER RPI (\$M)	NASA FY05 Fac. ASC with Exclusions PER RPI % of CRV	NASA FY05 Fac. ASC with Active Status (\$M)	NASA FY05 Fac. ASC with a Non-Active Status (\$M)
Ames Research Center	\$2,368	\$33	1.38	\$25	1.07	\$20	\$13
Crows Landing	\$74	\$1	1.89	\$0	0.17	\$0	\$1
Camp Parks	\$5	\$0	5.56	\$0	5.23	\$0	\$0
Moffet Federal Airfield	\$1,104	\$14	1.26	\$5	0.44	\$4	\$10
<b>Ames Research Center Total</b>	<b>\$3,551</b>	<b>\$48</b>	<b>1.36</b>	<b>\$31</b>	<b>0.86</b>	<b>\$24</b>	<b>\$24</b>
Dryden Flight Research Center	\$274	\$5	1.71	\$5	1.71	\$5	\$0
<b>Dryden Flight Research Center Total</b>	<b>\$274</b>	<b>\$5</b>	<b>1.71</b>	<b>\$5</b>	<b>1.71</b>	<b>\$5</b>	<b>\$0</b>
Glenn Research Center	\$1,785	\$25	1.42	\$25	1.40	\$25	\$1
Plum Brook Station	\$707	\$7	1.02	\$7	1.02	\$5	\$2
<b>Glenn Research Center Total</b>	<b>\$2,492</b>	<b>\$32</b>	<b>1.30</b>	<b>\$32</b>	<b>1.29</b>	<b>\$30</b>	<b>\$3</b>
Langley Research Center	\$2,612	\$30	1.15	\$28	1.06	\$27	\$3
<b>Langley Research Center Total</b>	<b>\$2,612</b>	<b>\$30</b>	<b>1.15</b>	<b>\$28</b>	<b>1.06</b>	<b>\$27</b>	<b>\$3</b>
<b>Code R (Aerospace Technology) Total</b>	<b>\$8,928</b>	<b>\$115</b>	<b>1.29</b>	<b>\$95</b>	<b>1.07</b>	<b>\$86</b>	<b>\$30</b>
Goddard Space Flight Center	\$902	\$16	1.78	\$16	1.78	\$16	\$0
Bilateral Ranging Transponder Total	\$0	\$0	2.72	\$0	2.72	\$0	\$0
Mobile Laser Site Total	\$2	\$0	1.82	\$0	1.06	\$0	\$0
Spaceflight Tracking Data Network Total	\$38	\$1	2.88	\$1	1.44	\$1	\$1
Space Transportation System Total	\$0	\$0	2.26	\$0	0.00	\$0	\$0
Verylong Baseline Interferometry Total	\$0	\$0	2.94	\$0	0.15	\$0	\$0
Wallops Flight Facility	\$622	\$8	1.32	\$8	1.24	\$8	\$1
National Balloon Facility, Palestine, TX	\$5	\$0	1.66	\$0	1.66	\$0	\$0
Poker Flats Research Range, Fairbanks, AK	\$6	\$0	3.18	\$0	3.18	\$0	\$0
<b>Goddard Space Flight Center Total</b>	<b>\$1,575</b>	<b>\$26</b>	<b>1.63</b>	<b>\$25</b>	<b>1.56</b>	<b>\$25</b>	<b>\$1</b>
<b>Code Y (Earth Sciences) Total</b>	<b>\$1,575</b>	<b>\$26</b>	<b>1.63</b>	<b>\$25</b>	<b>1.56</b>	<b>\$25</b>	<b>\$1</b>
Jet Propulsion Laboratory	\$650	\$11	1.63	\$11	1.63	\$11	\$0
Canberra Deep Space Communications Complex, Australia	\$113	\$6	5.03	\$6	5.03	\$6	\$0
Goldstone, Deep Space Communications Complex, CA	\$220	\$8	3.80	\$8	3.80	\$8	\$1
Madrid Deep Space Communications Complex, Spain	\$110	\$5	4.36	\$5	4.36	\$5	\$0
<b>Deep Space Network Total</b>	<b>\$443</b>	<b>\$19</b>	<b>4.26</b>	<b>\$19</b>	<b>4.26</b>	<b>\$18</b>	<b>\$1</b>
Table Mountain Observatory	\$7	\$0	1.47	\$0	1.47	\$0	\$0
<b>Jet Propulsion Laboratory Total</b>	<b>\$1,099</b>	<b>\$29</b>	<b>2.68</b>	<b>\$29</b>	<b>2.68</b>	<b>\$29</b>	<b>\$1</b>
<b>Code S (Astrobiology &amp; Space Research/Science) Total</b>	<b>\$1,099</b>	<b>\$29</b>	<b>2.68</b>	<b>\$29</b>	<b>2.68</b>	<b>\$29</b>	<b>\$1</b>
Johnson Space Center	\$1,352	\$17	1.29	\$17	1.28	\$17	\$0
Ellington Field	\$88	\$2	2.02	\$2	2.02	\$2	\$0
Palmdale, NASA Industrial Plant	\$0	\$0		\$0		\$0	\$0
Palmdale, USAF Industrial Plant	\$0	\$0		\$0		\$0	\$0
<b>Palmdale, Industrial Plant Total</b>	<b>\$0</b>	<b>\$0</b>		<b>\$0</b>		<b>\$0</b>	<b>\$0</b>
White Sands Test Facility	\$208	\$4	1.79	\$4	1.79	\$4	\$0
WSTF Space Harbor	\$2	\$0	4.38	\$0	4.38	\$0	\$0
White Sands 1st TDRSS	\$40	\$1	2.40	\$1	2.40	\$1	\$0
White Sands 2nd TDRSS	\$19	\$0	2.37	\$0	2.37	\$0	\$0
<b>Johnson Space Center Total</b>	<b>\$2,062</b>	<b>\$32</b>	<b>1.55</b>	<b>\$27</b>	<b>1.29</b>	<b>\$27</b>	<b>\$5</b>
Kennedy Space Center	\$4,307	\$85	1.97	\$80	1.86	\$84	\$1
Cape Canaveral Air Force Station	\$162	\$2	1.43	\$2	1.41	\$2	\$0
<b>Transoceanic Abort Landing Sites Total</b>	<b>\$10</b>	<b>\$0</b>	<b>1.93</b>	<b>\$0</b>	<b>1.93</b>	<b>\$0</b>	<b>\$0</b>
Gambia	\$8	\$0	2.03	\$0	2.03	\$0	\$0

*FY 2005 AGENCY-WIDE FACILITIES SUSTAINMENT MODEL*

NAME	FY 2003 CRV (\$M)	NASA FY05 Fac. ASC with no Exclusions	NASA FY05 Fac. ASC with no Exclusions % of CRV	NASA FY05 Fac. ASC with Exclusions PER RPI (\$M)	NASA FY05 Fac. ASC with Exclusions PER RPI % of CRV	NASA FY05 Fac. ASC with Active Status (\$M)	NASA FY05 Fac. ASC with a Non- Active Status (\$M)
Morocco	\$2	\$0	1.48	\$0	1.48	\$0	\$0
<b>Kennedy Space Center Total</b>	<b>\$4,479</b>	<b>\$87</b>	<b>1.95</b>	<b>\$83</b>	<b>1.85</b>	<b>\$86</b>	<b>\$1</b>
Marshall Space Flight Center	\$1,311	\$16	1.19	\$14	1.06	\$13	\$2
Brigham City, Utah	\$1	\$0	2.44	\$0	2.44	\$0	\$0
Michoud Assembly Facility	\$1,107	\$16	1.41	\$14	1.29	\$14	\$1
Santa Susanna Field Laboratory	\$89	\$1	1.40	\$1	1.40	\$1	\$0
<b>Marshall Space Flight Center Total</b>	<b>\$2,508</b>	<b>\$33</b>	<b>1.30</b>	<b>\$29</b>	<b>1.17</b>	<b>\$29</b>	<b>\$4</b>
Stennis Space Center	\$1,496	\$20	1.33	\$20	1.31	\$13	\$7
SSC Tenants	\$128	\$2	1.19	\$2	1.19	\$2	\$0
<b>Stennis Space Center Total</b>	<b>\$1,624</b>	<b>\$21</b>	<b>1.32</b>	<b>\$21</b>	<b>1.30</b>	<b>\$14</b>	<b>\$7</b>
<b>Code M (Human Exploration &amp; Development of Space) Total</b>	<b>\$10,665</b>	<b>\$173</b>	<b>1.62</b>	<b>\$160</b>	<b>1.50</b>	<b>\$156</b>	<b>\$17</b>
<b>Nasa Total (\$M)</b>	<b>\$22,276</b>	<b>\$344</b>	<b>1.54</b>	<b>\$309</b>	<b>1.39</b>	<b>\$295</b>	<b>\$49</b>